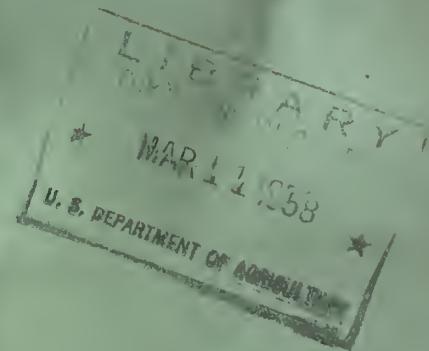


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Do not assume content reflects current scientific knowledge, policies, or practices.

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Federal - State Cooperative
now Surveys and Water Supply Forecasts
for
ARIZONA



Soil Conservation Service
United States Department of Agriculture

Data included in this report were obtained by the agency named above in cooperation with the Federal, State and local organizations listed on the last page of this report.

AS OF
APR. 1, 1954

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

TO RECIPIENTS OF COOPERATIVE SNOW SURVEY
AND WATER SUPPLY FORECAST REPORTS:

Forecasts by U. S. Weather Bureau of total annual streamflow October-September, inclusive, at more than 300 gaging stations are issued monthly January through May in the publication WATER SUPPLY FORECASTS FOR THE WESTERN UNITED STATES.

Weather Bureau forecasts of runoff presented in that bulletin are computed from procedures based on mathematical analysis of the relation between precipitation and runoff.

The Weather Bureau bulletins may be secured by writing to:

Hydrologist in Charge
River Forecast Center
U. S. Weather Bureau
712 Federal Office Building
Kansas City 6, Missouri

For current information on local river and flood conditions, reference should be made to the appropriate River District Office, listed below:

Meteorologist in Charge.....Colorado River and
Weather Bureau Airport Station tributaries in Arizona
3000 Sky Harbor Blvd., except San Juan
Phoenix, Arizona

State of Arizona

COOPERATIVE SNOW SURVEYS and WATER SUPPLY FORECASTS

for

A R I Z O N A

(Salt, Verde, Gila
and
part of Lower Colorado River Basin)

Issued

April 1, 1954

Report Prepared
By
W. E. Anderson, Snow Survey Leader

Salt River Valley Water Users' Association
and
Soil Conservation Service
Main Post Office Bldg.
Phoenix, Arizona

Issued By

Robert V. Boyle
State Conservationist
Soil Conservation Service

W. W. Pickerell
President
Salt River Valley Water Users' Ass'n.

100

1. *What is the relationship between the two groups?*

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The following organizations cooperate in the Arizona snow survey work:

FEDERAL

Department of Agriculture

Forest Service

Apache Forest

Coconino Forest

Coronado Forest

Gila Forest

Kaibab Forest

Prescott Forest

Sitgreaves Forest

Southwestern Forest and Range Experiment

Station, Fort Valley, Arizona

Sierra Ancha Forest Experiment Station

Soil Conservation Service

Department of Commerce

Weather Bureau

Arizona Section

Department of Interior

Bureau of Reclamation

Region III

Geological Survey

Arizona District

Bureau of Indian Affairs

Fort Apache Reservation

National Park Service

Grand Canyon National Park

Gila Water Commissioner, Safford, Arizona

IRRIGATION PROJECTS

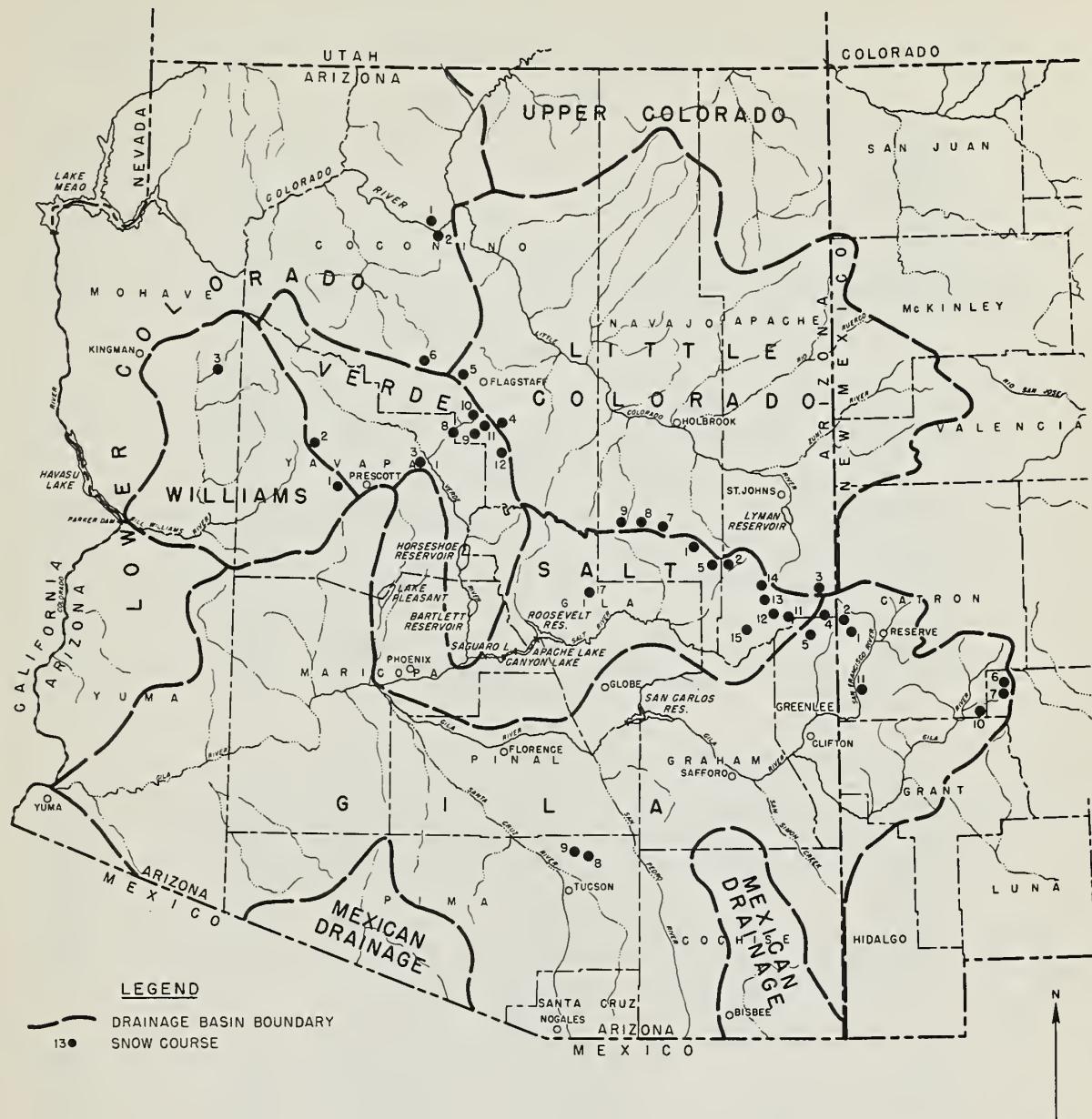
Salt River Valley Water Users' Association,
Phoenix, Arizona

San Carlos Irrigation and Drainage District,
Coolidge, Arizona

SOUTHWEST LUMBER MILLS, INC., McNary, Arizona

Other organizations and individuals furnish valuable information for the snow survey reports. Their cooperation is gratefully acknowledged.





**ARIZONA
COOPERATIVE SNOW SURVEYS**
SNOW COURSES AND DRAINAGE BASINS
JANUARY 1954

0 40 80 120 160 200
SCALE IN MILES

INDEX TO SNOW COURSES

NUMBER	NAME	SEC	TWP	RGE*	ELEVATION
<u>LITTLE COLORADO RIVER</u>					
1. Forest Dale	2	9N	21E		6,000
2. McNary	14	8N	23E		7,200
3. Nutrioso	23	6N	30E		8,500
4. Mormon Lake	13	18N	8E		7,350
5. Fort Valley	22	22N	6E		7,350
7. Gentry	36	11N	15E		7,600
8. Heber	28	11N	15E		7,600
9. Canyon Creek	18	11N	15E		7,500
11. Mormon Mountain	14	18N	8E		7,500
12. Happy Jack	30	17N	9E		7,630
<u>WILLIAMS RIVER</u>					
1. Iron Springs	22	14N	3W		6,200
2. Camp Wood	3	16N	6W		5,700
3. Willow Ranch	16	21N	11W		5,000
<u>GILA RIVER</u>					
1. Frisco Divide (N.M.)	31	65	20W **		8,000
2. State Line (N.M.)	6	65	21W		8,000
3. Nutrioso	23	6N	30E		8,500
4. Coronado Trail	26	5N	30E		8,000
5. Beaver Head	13	4N	30E		8,000
6. Taylor Creek (N.M.)	20	10S	10W **		7,850
7. Inman (N.M.)	6	11S	10W **		7,800
8. Rose Canyon	15	12S	16E		7,300
9. Bear Wallow	6	12S	16E		8,100
10. Black Canyon (N.M.)	8	13S	11W **		6,790
11. Mogollon (N.M.)	2	11S	19W **		7,000
<u>VERDE RIVER</u>					
1. Iron Springs	22	14N	3W		6,200
2. Camp Wood	3	16N	6W		5,700
3. Mingus Mountain	3	15N	2E		7,100
4. Mormon Lake	13	18N	8E		7,350
5. Fort Valley	22	22N	6E		7,350
6. Chalender	27	22N	3E		7,100
8. Munds Park	7	18N	7E		6,500
9. Casner Park	19	18N	8E		6,930
10. Antelope Park					7,300
11. Mormon Mountain	14	18N	8E		7,500
12. Happy Jack	30	17N	9E		7,630
<u>SALT RIVER</u>					
1. Forest Dale	2	9N	21E		6,000
2. McNary	14	8N	23E		7,200
3. Nutrioso	23	6N	30E		8,500
4. Coronado Trail	26	5N	30E		8,000
5. Milk Ranch	28	8N	23E		7,000
7. Gentry	36	11N	15E		7,600
8. Heber	28	11N	15E		7,600
9. Canyon Creek	18	11N	15E		7,500
11. Big Lake Knoll	3	5N	28E		8,800
12. Maverick Ford	13	6N	27E		9,050
13. Baldy	28	7N	27E		9,000
14. Ft. Apache	18	7N	27E		9,160
15. Pacheta		At Town of Maverick, Arizona			7,800
17. Workman Creek	33	6N	14E		6,900
<u>LOWER COLORADO RIVER</u>					
1. Bright Angel	34	33N	3E		8,400
2. Grand Canyon	21	30N	4E		7,500
5. Fort Valley	22	22N	6E		7,350
6. Chalender	27	22N	3E		7,100

* All in Gila and Salt River Base and Meridian except where otherwise indicated.

** New Mexico Principal Meridian

WATER SUPPLY OUTLOOK

ARIZONA

APRIL 15, 1954

* The record storm of March 22-23-24 has greatly improved*
* the outlook on the Salt-Verde Watersheds, with some *
* 250,000 acre feet of unexpected water already in the *
* reservoirs. Conditions are now about normal for these *
* basins. The Gila drainage also benefited, but to a *
* lesser degree. Approximately 40,000 AF of water has *
* already been received, but indications are that unless *
* additional storms occur the runoff for this basin will *
* continue much below normal.
*

WATERSHED CONDITIONS

The storm of March 22-23-24 was among the greatest on record and is reported by the Weather Bureau as exceeding all similar storms back to 1905. March precipitation, approximately 90 to 95% of which occurred during this storm period, was recorded at selected stations as follows:

Maverick	7.97"	McNary	8.29"
Workman Creek	12.15"	Natural Bridge	6.58"
Heber	3.05"	Rim area near Heber	6.98"
Oak Creek (Junipine)	7.32"	Mingus Mountain	5.85"

On the Bill Williams drainage:

Bagdad	5.50"	Camp Wood	6.24"
--------	-------	-----------	-------

The storm was not as heavy over the San Francisco and Gila River watersheds. We do not as yet have weather bureau figures for the New Mexico stations but they are reported as being generally substantially below those reported from the Salt-Verde watersheds. Figures so far received indicate that higher country on the Gila Basin received some $2\frac{1}{2}$ " of precipitation, while on the Frisco it amounted to about $3\frac{1}{2}$ ". In lower areas it dropped to $1\frac{1}{2}$ to $1-3/4$ " in the Glenwood and Safford areas.

Soil moisture conditions have been greatly improved as a

result of this storm. The ground is wet everywhere, with water reported as standing on the surface of small depressions, indicating probable saturation of underlying materials. Streams are reported as flowing at steady rates, with smaller ones generally carrying clear water. Water is standing in borrow pits along roads and is flowing beneath the remaining snow.

Temperatures are comparatively mild, with below-freezing periods at night too short to permit the cold to strike through the remaining snow pack and retard melting. The ground is warm and deeper snows appear to be thawing on the bottom of the pack.

With soil moisture conditions as they are at present, any good storm in the next two weeks would result in increased runoff. Normally, from 1" to 1 $\frac{1}{2}$ " of rain could be expected during April in the higher areas.

SNOW COVER

Present snow cover accumulated from the recent snow and is melting very rapidly. Practically all courses were bare before the storm, but snow depths reported subsequent to the storm amounted to approximately 3 feet at Bright Angel, 2 feet in the Baldy area of the White Mountains, and slightly over one foot on Mormon Mountain. Headwaters of the Blue, Frisco and Gila did not receive substantial amounts as the storm died out rapidly towards the East. What snow did fall was largely lost to warm weather prior to the April 1 measurement date.

There is still a lot of water to come from the snow, but melting is progressing so rapidly that the water is coming out fast. Present high flows will not last long as the remaining snow will soon be gone. However, it is expected that stream flows will fall slowly as much water remains in the ground and will be draining out for some time. Flows on the Salt should hold up well until near the end of April, with other streams dropping somewhat more rapidly. The Gila watershed is in rather poor shape and low flows are to be expected.

GENERAL

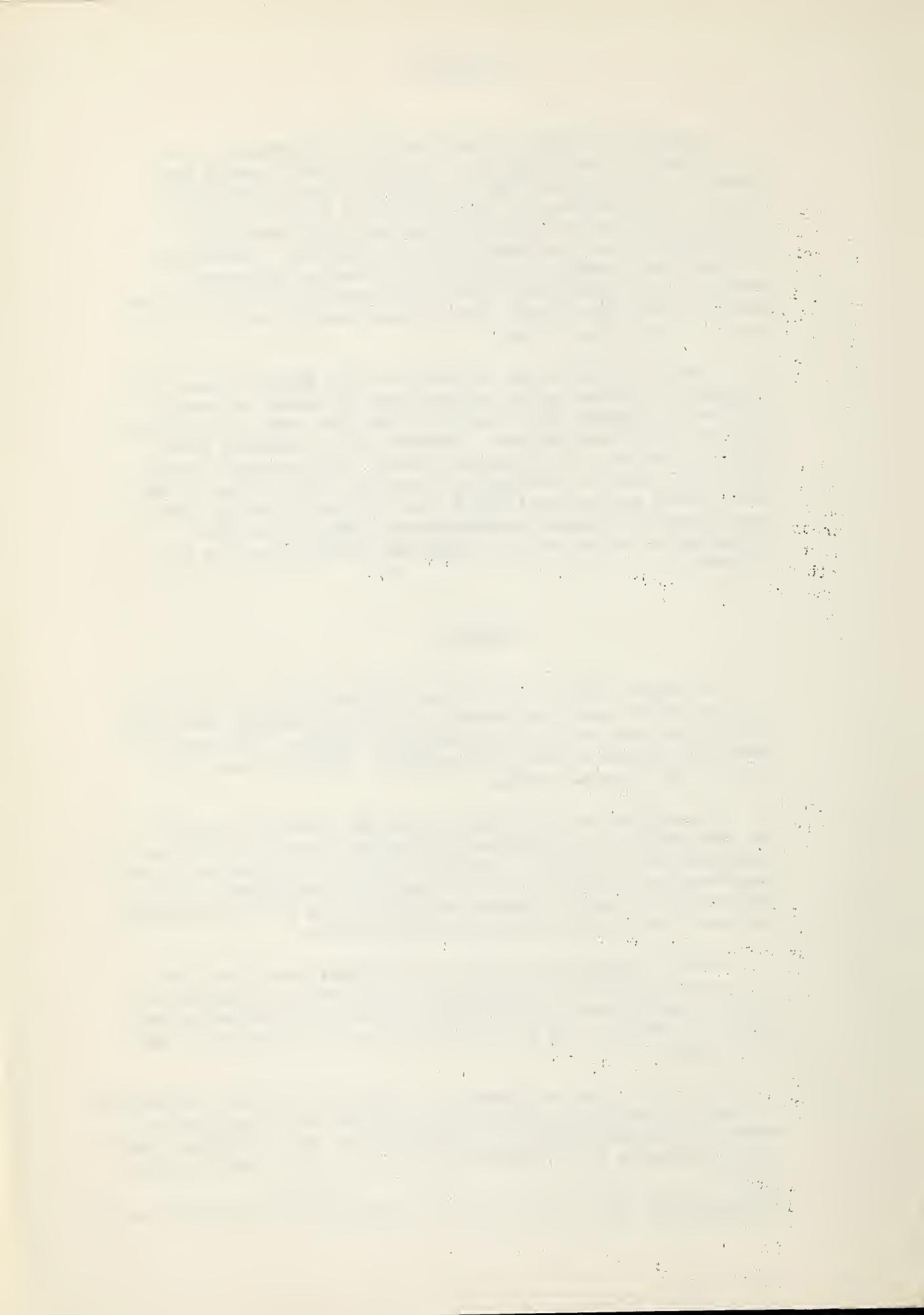
The water canyon road between Springerville and Maverick is reported to have been traveled by truck recently, with only about 6" of snow encountered except for drifts. The snow in that area is also melting off rapidly. Maverick reports no snow on the Pacheta course.

The Weather Bureau 30-Day Prognostic Forecast indicates the probability that about average rainfall and normal temperature conditions will prevail. On this basis some showers would be expected, which could add to the presently anticipated runoff. Conversely, if warm dry winds should start to blow considerable moisture would be lost to direct evaporation.

Runoff expectations prior to this storm were very low, but the storm was of such magnitude that present expectations are for approximately 100% of median values on the Verde, 90% on the Salt-Tonto, 70% on the Frisco-Blues and only 50% on the Gila basins.

Most of the smaller lakes have filled or received substantial increases in storage. Lake Mary and Mormon Lake have visibly increased, though figures on the amount are not available. Lakes and sinkholes in the Showlow-Lakeside area are filled or almost filled.

SPECIAL NOTE: This will be the last report for the current season.

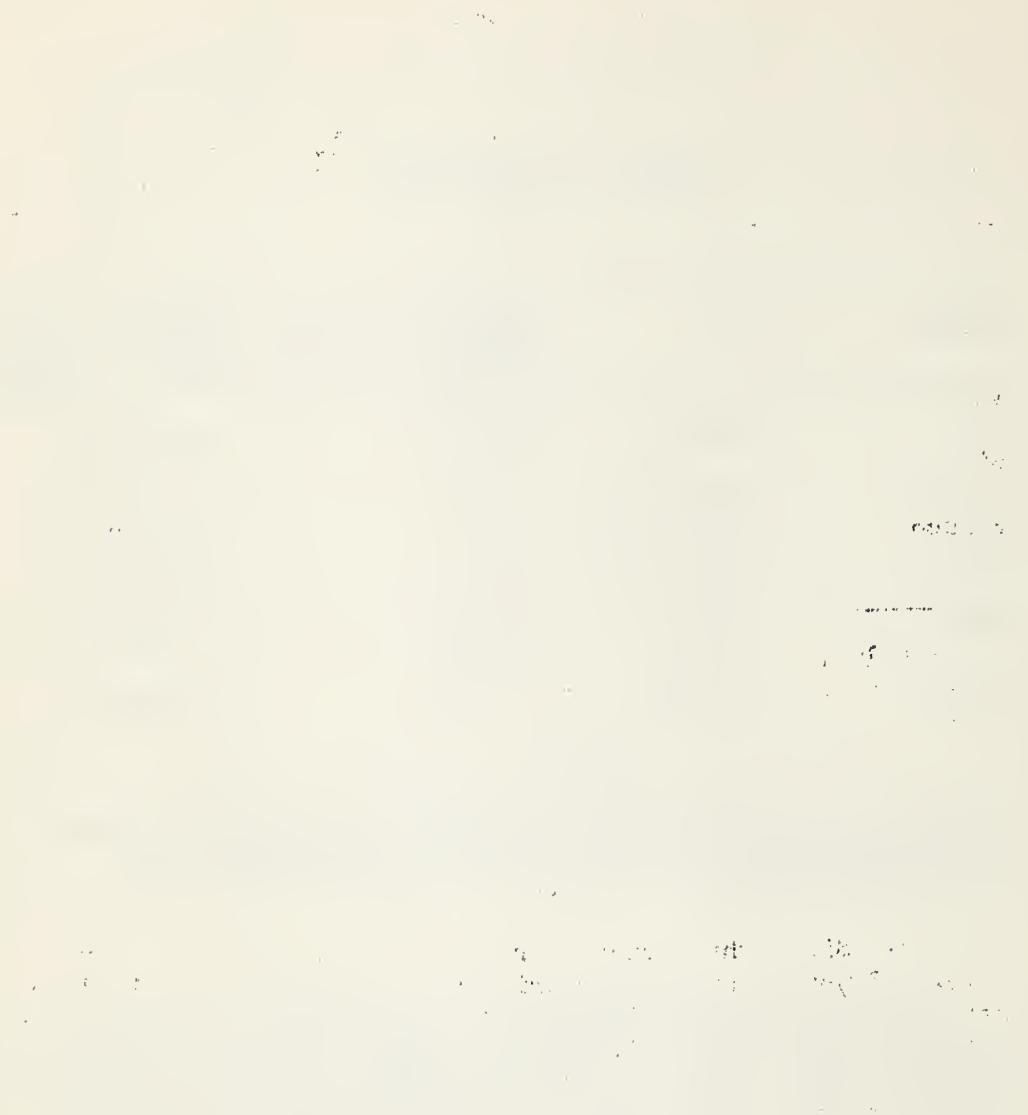


STREAM FLOW FORECASTS

RIVER	AT	APRIL-MAY, incl. DISCHARGE FORECAST ACRE FEET	PROBABLE MAXIMUM FLOW THAT WOULD NOT BE EXCEEDED*
Salt	Intake	101,000	146,000
Tonto	Roosevelt	8,300	21,000
Verde	Horseshoe	59,000	106,000
Gila	Warden	5,600	13,700
Frisco	Clifton	7,100	13,900

*Generally representing one standard error but in one case representing two standard errors from plotted curves or regression formula.

Users of these forecasts should note they are based on statistically determined regression lines established by correlation between runoff, snow water content, and precipitation factors. Since the period of record is comparatively short (i.e., 16 years maximum for Arizona snow courses) and includes several years of unusual conditions, such as 1941, the distributional errors of sampling may well be rather large. The resulting spread between forecast and actual conditions will narrow progressively as the period of record becomes longer with consequent improvements in correlation and decrease in relative importance of the effect of the years of extreme variability.

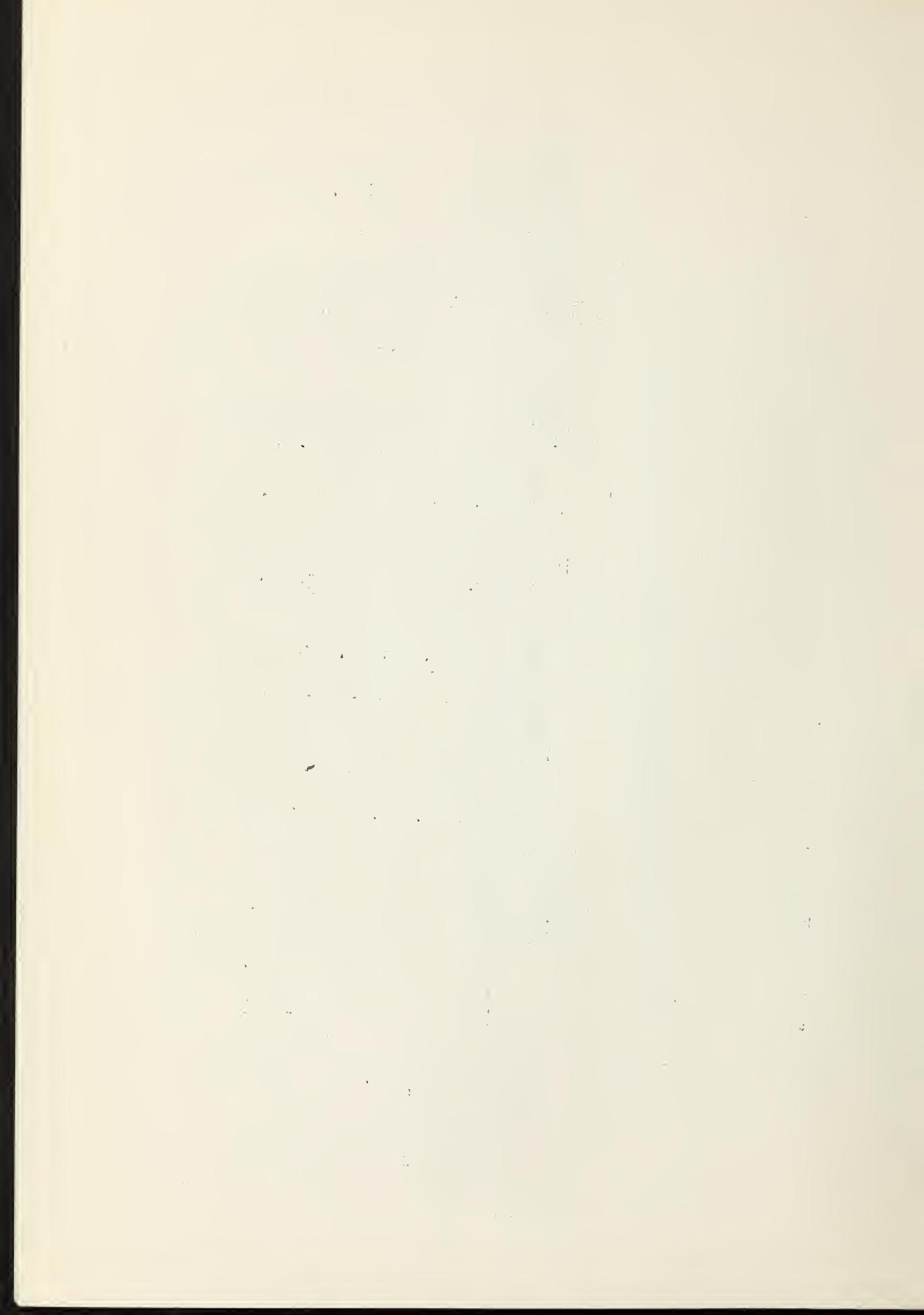


SNOW SURVEYS AND IRRIGATION WATER FORECASTS FOR ARIZONA

APRIL 1, 1954

SUMMARY OF APRIL 1 SNOW SURVEYS AND COMPARISON OF DATA WITH THAT OF PREVIOUS YEARS BY WATERSHEDS

WATERSHEDS	No. of Courses in Average	Snow Depth 1954 Inches	Snow Water Content in Inches				Snow Density 1954 %	1954 Water Content in percent of	1953	Average
			1954	1953	1952	Average				
Gila River	7	0.0	0.0	0.0	2.4	0.8	0	---	---	---
Salt River	11	6.7	2.3	1.7	7.4	2.1	34	135	109	96
Verde River	10	5.9	2.2	0.0	5.1	2.3	37	220	110	110
Williams River	3	4.2	1.1	0.0	0.0	0.0	26	110	462	109
Lower Colorado River	4	12.3	3.7	0.8	10.5	3.4	30	210	78	78
Little Colorado River	8	5.4	2.1	0.0	6.8	2.7	39			



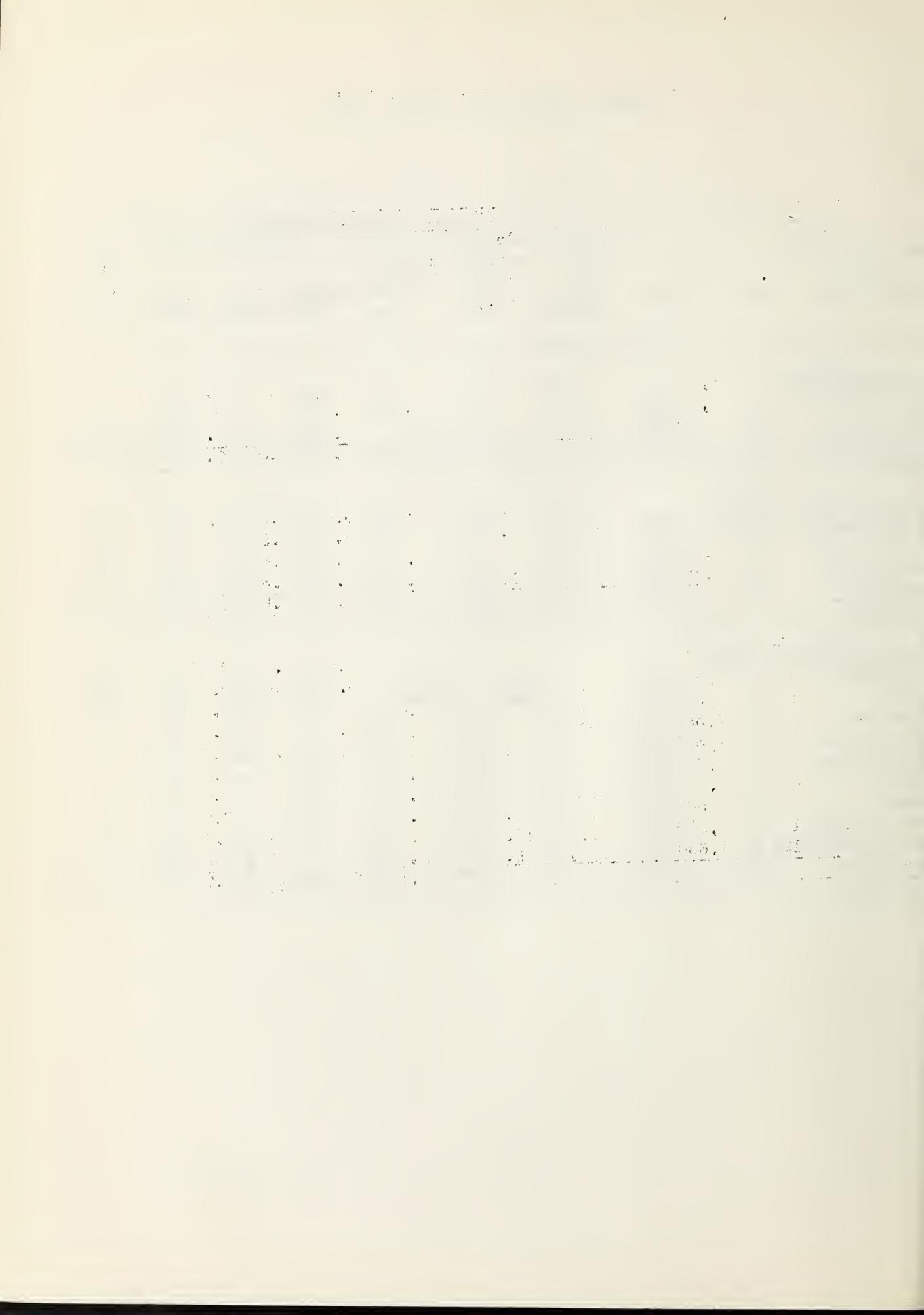
ARIZONA SNOW SURVEYS APRIL 1, 1954

DRAINAGE BASIN and SNOW COURSE		No.	Elev.	SNOW COVER MEASUREMENTS			PAST RECORD			Years of Average Reco.
				Date of Survey	Snow Depth (in.)	Water Content (in.)	Water 1953	Content 1952	Average	
GILA RIVER										
Frisco Divide	1	8,000	4/2		0.0	0.0	0.0	0.9	0.6	14
State Line	2	8,000	4/2		0.0	0.0	0.0	0.7	0.4	14
Nutrioso	3	8,500	4/2		0.0	0.0	-	2.0	0.6	13
Coronado Trail	4	8,000	4/2		0.0	0.0	-	5.3	1.5	13
Beaverhead	5	8,000	4/2		0.0	0.0	0.0	3.2	0.9	14
Taylor Creek	6	7,850	4/1		0.0	0.0	0.0	-	0.1	9
Inman	7	7,800	4/1		0.0	0.0	0.0	-	0.1	5
Rose Canyon*	8	7,300		Report Delayed		0.0*	1.7*	0.5*		5
Bear Wallow*	9	8,100		Report Delayed		0.0*	6.3*	1.8*		5
Black Canyon	10	6,790		Report Delayed		0.0	-	0.0		1
Mogollon	11	7,000		Report Delayed		0.0	-	0.0		1
Average					0.0	0.0	0.0	2.4	0.8	
SALT RIVER										
Forestdale	1	7,000		Report Delayed		0.0	0.0	0.01		14
McNary	2	7,200		Report Delayed		0.0	0.0	0.2		14
Nutrioso	3	8,500	4/2	0.0	0.0	-	2.0	0.6		13
Coronado Trail	4	8,000	4/2	0.0	0.0	-	5.3	1.5		13
Beaverhead	5	8,000	4/2	0.0	0.0	0.0	3.2	0.9		14
Milk Ranch	5	7,000		Report Delayed		0.0	-	0.02		11
Gentry	7	7,600	3/31	1.7	0.6	0.0	-	0.0		1
Heber	8	7,600	3/31	3.7	1.2	0.0	-	0.0		1
Canyon Creek	9	7,500	3/31	6.2	2.3	0.0	-	0.0		1
Maverick Fork	12	9,020	3/30	20.6	7.5	4.0	-	2.8		2
Baldy	13	9,125	3/30	16.1	5.1	4.7	14.7	4.9		4
Ft. Apache	14	9,160	3/30	22.5	7.4	6.8	16.2	6.7		4
Pacheta	15	7,800	4/1	0.0	0.0	0.0	4.9	2.5		2
Workman Creek	17	6,900	3/31	2.5	1.2	0.0	5.9	3.0		2
Average					6.7	2.3	1.7	7.4	3.1	
VERDE RIVER										
Iron Springs	1	6,200	3/26	8.4	2.2	0.0	0.0	0.0		8
Camp Wood	2	5,700	4/1	0.0	0.0	0.0	T	0.0		8
Mingus Mountain	3	7,100	4/1	0.0	0.0	0.0	T	0.0		6
Mormon Lake	4	7,350	4/1	10.6	3.9	0.0	8.3	6.7		5
Fort Valley	5	7,350	4/1	7.2	2.1	0.0	5.6	1.7		7
Chalender	6	7,100	4/1	0.7	0.3	0.0	9.3	2.4		7
Munds Park	8	6,500	4/1	4.3	1.5	0.0	-	0.0		1
Casner Park	9	6,930	4/1	7.6	3.3	0.0	-	0.0		1
Mormon Mountain	11	7,500	4/1	14.5	6.0	0.0	11.1	5.6		2
Happy Jack	12	7,630	3/31	5.8	2.4	-	6.8	6.8		1
Gaddes Canyon*	13	7,600	4/1	11.4*	4.1*	-*	-	-	*	0
Average					5.9	2.2	0.0	6.1	2.3	

* Not included in averages

ARIZONA SNOW SURVEY APRIL 1, 1954

DRAINAGE BASIN and SNOW COURSE		No.	Elev.	SNOW COVER MEASUREMENTS					Years cf Record	
				1954		PAST RECORD				
				Date of Survey	Snow Depth (in.)	Water Content (in.)	Water Content (in.)	Aver.		
WILLIAMS RIVER										
Iron Springs	1	6,200	3/26	8.4	2.2	0.0	0.0	0.0	8	
Camp Wood	2	5,700	4/1	0.0	0.0	0.0	T	0.0	8	
Willow Ranch	3	5,000		Report Delayed		0.0	-	0.0	5	
Average					4.2	1.1	0.0	0.0		
LOWER COLORADO RIVER										
Bright Angel	1	8,400	4/1	37.0	10.6	3.0	22.5	8.2	6	
Grand Canyon	2	7,500	4/1	4.5	1.6	0.0	4.5	1.2	6	
Fort Valley	5	7,350	4/1	7.2	2.1	0.0	5.6	1.7	7	
Chalender	6	7,100	4/1	0.7	0.3	0.0	9.3	2.4	7	
Average					12.3	3.6	0.8	10.5	3.4	
LITTLE COLORADO RIVER										
Forestdale	1	7,000		Report Delayed		0.0	0.0	0.01	14	
McNary	2	7,200		Report Delayed		0.0	0.0	0.2	14	
Nutrioso	3	8,500	4/2	0.0	0.0	-	2.0	0.6	15	
Mormon Lake	4	7,350	4/1	10.6	3.9	0.0	8.3	6.7	5	
Fort Valley	5	7,350	4/1	0.7	0.3	0.0	5.6	1.7	7	
Gentry	7	7,600	3/31	1.7	0.6	0.0	-	0.0	1	
Heber	8	7,600	3/31	3.7	1.2	0.0	-	0.0	1	
Canyon Creek	9	7,500	3/31	6.2	2.3	0.0	-	0.0	1	
Mormon Mountain	11	7,500	4/1	14.5	6.0	0.0	11.1	5.6	2	
Happy Jack	12	7,630	3/31	5.8	2.4	-	6.8	6.8	1	
Average					5.4	2.1	0.0	6.8	2.7	



STATUS OF RESERVOIR STORAGE APRIL 1, 1954

BASIN and STREAM	RESERVOIR	USABLE CAPACITY (Thous. A.F.)	THOUSAND ACRE FEET IN STORAGE ABOUT APRIL 1				10 Year Average 1942-51
			1954	1953	1952	1951	
Agua Fria	Lake Pleasant	178	46	28	138	1	20
Colorado	Lake Havasu	688	643	622	604	604	617
Colorado	Lake Mohave	1,810	1,776	1,639	1,586	1,534	-
Colorado	Lake Mead	27,935	15,731	17,747	15,663	16,804	18,430
Gila	San Carlos	1,285	40	14	160	1	214
Verde	Bartlett	180	65	48	156	7	64
Verde	Horseshoe	143	76	1	118	1	17*
Salt	Roosevelt	1,382	693	1,049	682	5	517
Salt	Apache	245	245	236	233	136	202
Salt	Canyon	58	57	52	52	55	41
Salt	Saguaro	70	59	51	50	48	43

* Average for years 1946 through 1951.

LIST OF SNOW SURVEYORS

<u>SNOW COURSE</u>	<u>SURVEYOR</u>
Baldy	SCS and SRVWU
Bear Wallow	Wm. Hughes & J. R. Brinkley
Beaver Head	Jess Burke
Black Canyon	E. Van Winkle
Bright Angel	Valentine & Buss
Camp Wood	Mrs. C. C. Merritt
Canyon Creek	SCS and SRVWU
Casner Park	SCS and SRVWU
Chalender	M. C. Oleson & F. G. Doughert
Coronado Trail	Frank Casanova
Forest Dale	Olson
Frisco Divide	J. B. Shumate
Ft. Apache	SCS and SRVWU
Fort Valley	A. P. Loska
Gaddes Canyon	Richard Enz
Gentry	SCS and SRVWU
Grand Canyon	Dazey and Black
Happy Jack	Emil Ryberg
Heber	SCS and SRVWU
Inman	F. M. Inman
Iron Springs	Ernest Saxby
Maverick Fork	SCS and SRVWU
Milk Ranch	Olson
Mingus Mountain	Richard Enz
Mogollon	J. R. Wray
Mormon Lake	SCS and SRVWU
Mormon Mountain	SCS and SRVWU
Munds Park	SCS and SRVWU
McNary	Olson
Nutrioso,	Frank Casanova
Pacheta	Foch Phillips
Rose Canyon	Wm. Hughes & J. R. Brinkley
State Line	J. B. Shumate
Taylor Creek	F. M. Inman
Willow Ranch	L. W. Miller
Workman Creek	C. L. Moore

Federal - State - Private
COOPERATIVE SNOW SURVEYS

Furnishes the basic data necessary for forecasting water supply for irrigation, domestic and municipal water supply, hydro-electric power generation, navigation, mining and industry

"WATER IS THE WEST'S GREATEST RESOURCE"